

AMENDMENTS TO THE CLAIMS

1-38. (Canceled)

39. (Currently amended) A variable frequency tag, comprising:

[[a)]] ~~interfacing means for receiving~~ circuitry configured to:

receive interrogating radiation at the tag and ~~generating~~ generate a corresponding received signal[[,]]; and

~~for receiving~~ receive a signature signal and ~~radiating~~ radiate corresponding response radiation;

[[b)]] ~~processing means for receiving~~ circuitry configured to receive the received signal and ~~outputting~~ output the signature signal in response, wherein the signature signal ~~including~~ includes a signature code ~~for use in identifying that identifies~~ the tag;

[[c)]] ~~clocking means for controlling~~ circuitry configured to control a rate at which the signature code is output; and

[[d)]] ~~power supplying means for providing~~ circuitry configured to provide an electrical potential difference for energizing the tag; [[and]]

[[e)]] wherein the clocking ~~means being operable~~ circuitry is further configured to control the output of the signature code at a rate ~~which that~~ is governed by a magnitude of the received signal.

40. (Currently amended) The tag ~~according to~~ of claim 39, wherein the clocking ~~means includes~~ circuitry comprises first and second oscillators, wherein the first oscillator ~~being operable is configured~~ to clock the processing ~~means,~~ circuitry and the second oscillator ~~being operable is configured~~ to control a frequency at which the signature code is output from the tag in response to the magnitude of the received signal.

41. (Currently amended) The tag ~~according to~~ of claim 40, wherein the first oscillator is ~~arranged~~ further configured to oscillate at a substantially constant frequency.

42. (Currently amended) The tag ~~according to~~ of claim 39, wherein the power supplying means circuitry is coupled to the interfacing means circuitry, and wherein the power supplying means being operable circuitry is configured to derive the potential difference from the received signal.

43. (Currently amended) The tag ~~according to~~ of claim 42, wherein the power supplying means includes circuitry comprises a transformer ~~for enhancing~~ configured to enhance the potential difference applied to the clocking means circuitry and the processing means circuitry.

44. (Currently amended) The tag ~~according to~~ of claim 43, wherein the transformer is a piezo-electric transformer.

45. (Currently amended) The tag ~~according to~~ of claim 44, wherein the transformer includes comprises:

a multilayer primary region ~~arranged~~ configured to be driven by the received signal[[,]]; and

a single-layer secondary region at which the potential difference is generated[[,]]; wherein the primary and secondary regions [[being]] are mechanically coupled.

46. (Currently amended) The tag ~~according to~~ of claim 39, wherein the power supplying means includes circuitry comprises potential difference limiting ~~means for preventing~~ circuitry configured to prevent excess supply potential damage to the processing means circuitry and the clocking means circuitry.

47. (Currently amended) The tag ~~according to~~ of claim 39, wherein the interfacing ~~means~~ circuitry comprises an antenna assembly ~~operable~~ configured to generate the response radiation from the received radiation by modulating reflectivity of the antenna assembly depending ~~[[upon]]~~ on tag power consumption.

48. (Currently amended) The tag ~~according to~~ of claim 39, wherein the interfacing ~~means~~ circuitry comprises an antenna assembly ~~operable~~ configured to generate the response radiation from the received radiation by modulating reflectivity of the antenna assembly, and wherein the processing ~~means being connected~~ circuitry is coupled in direct communication with the antenna assembly ~~for modulating and configured to modulate~~ the reflectivity of the antenna assembly with the signature code.

49. (Currently amended) The tag ~~according to~~ of claim 39, wherein the clocking ~~means~~ circuitry is ~~operable~~ further configured to clock the processing ~~means~~ circuitry at a rate which increases as the potential difference increases.

50. (Currently amended) The tag ~~according to~~ of claim 49, wherein the clocking ~~means~~ circuitry is ~~operable~~ further configured to increase the rate at which the processing ~~means~~ circuitry is clocked in a stepwise manner in response to increase in the potential difference.

51. (Currently amended) The tag ~~according to~~ of claim 50, wherein the clocking ~~means~~ circuitry comprises digital dividing ~~means for dividing~~ circuitry configured to divide a master clock signal to generate a clocking signal for clocking the processing ~~means~~ circuitry, and wherein the master clock signal ~~[[being]]~~ is derived from the received signal.

52. (Currently amended) The tag ~~according to~~ of claim 50, wherein the clocking ~~means~~ circuitry comprises digital dividing ~~means for dividing~~ circuitry configured to divide a

master clock signal generated by oscillating ~~means~~ circuitry, and wherein the master clock signal ~~[[being]]~~ is substantially constant in operation.

53. (Currently amended) The tag ~~according to~~ of claim 49, wherein the clocking ~~means~~ circuitry is ~~operable~~ further configured to increase the rate at which the processing ~~means~~ circuitry is clocked in a substantially linear manner in response to increase in the potential difference.

54. (Currently amended) The tag ~~according to~~ of claim 49, wherein the clocking ~~means~~ circuitry is ~~operable~~ further configured to increase the rate at which the processing ~~means~~ circuitry is clocking in a substantially logarithmic manner in response to increase in the potential difference.

55. (Currently amended) The tag ~~according to~~ of claim 49, wherein the clocking ~~means includes~~ circuitry comprises an oscillator ~~comprising~~ including a plurality of ~~serially connected~~ serially-connected logic gates configured with feedback therearound for generating a clocking signal for clocking the processing ~~means~~ circuitry, and wherein the logic gates ~~having~~ have a signal propagation therethrough ~~which~~ that is a function of the potential difference.

56. (Currently amended) The tag ~~according to~~ of claim 55, wherein the oscillator comprises ring-of-three logic gates configured with feedback therearound for generating the clocking signal.

57. (Currently amended) The tag ~~according to~~ of claim 39, wherein the processing ~~means~~ circuitry is ~~operable~~ further configured to dissipate a majority of power required to operate the tag.

58. (Currently amended) The tag ~~according to~~ of claim 39, wherein the processing ~~means circuitry~~ is ~~operable~~ further configured to output the signature code repetitively with pause intervals therebetween during which the code is not output.

59. (Currently amended) The tag ~~according to~~ of claim 58, wherein one of the pause intervals corresponds to at least 90% of an interval at which the signature code is output.

60. (Currently amended) The tag ~~according to~~ of claim 39, wherein the processing ~~means circuitry~~ is configured to be receptive to at least one synchronization pulse in the received signal and is switchable to a temporary wait state in which the processing ~~means circuitry~~ does not output ~~[[its]]~~ the signature code when the at least one synchronization pulses does not align to a synchronization time window after the tag outputs ~~[[its]]~~ the signature code.

61. (Currently amended) The tag ~~according to~~ of claim 39, wherein the processing ~~means includes circuitry comprises~~ CMOS logic circuits ~~for generating~~ configured to generate the signature code, and wherein the CMOS logic circuits ~~being operable~~ are configured to consume increasing power in operation as their clocking rate is increased.

62. (Withdrawn - currently amended) An interrogating device for interrogating at least one variable frequency tag according to claim 39, the device comprising:

[[a)] signal generating ~~means for generating~~ circuitry configured to generate an interrogating signal;

[[b)] interrogation interfacing ~~means~~ circuitry configured to:

~~for radiating~~ radiate the interrogating signal as interrogating radiation ~~towards~~ toward the at least one tag~~[[,]]~~; and

~~for receiving~~ receive response radiation from the at least one tag and ~~generating~~ generate a corresponding response signal; and

[[c)]] signal processing ~~means for filtering~~ circuitry configured to filter the response signal and thereby ~~isolating~~ isolate signal spectral components from the at least one tag and ~~extracting~~ extract signature codes from the signal components ~~for identifying~~ to identify the at least one tag.

63. (Withdrawn - currently amended) The device ~~according to~~ of claim 62, wherein the interrogation interfacing ~~means~~ circuitry comprises a directional antenna assembly ~~for interrogating~~ configured to interrogate the at least one tag from a plurality of relative angles, and ~~wherein~~ the signal processing ~~means is operable~~ circuitry is further configured to process response signals arising at the device for the plurality of relative angles to determine bearing of the at least one tag with respect to the device.

64. (Withdrawn - currently amended) An interrogating device for interrogating at least one variable frequency tag according to claim 39, the device comprising:

[[a)]] signal generating ~~means for generating~~ circuitry configured to generate an interrogating signal ~~comprising including~~ including an excitation component ~~for exciting~~ configured to excite at least one transformer of the at least one tag into resonance;

[[b)]] interrogation interfacing ~~means for radiating~~ circuitry configured to:
radiate the interrogating signal as interrogating radiation ~~towards~~ toward the at least one tag, ~~for exciting and excite~~ the at least one transformer into resonance ~~for generating to generate~~ an enhanced potential signal within the at least one tag[,]; and

~~for receiving~~ receive response radiation from the at least one tag and ~~generating~~ generate a corresponding response signal; and

[[c)]] signal processing ~~means for filtering~~ circuitry configured to filter the response signal and thereby ~~isolating~~ isolate signal spectral components from the at least one tag and ~~extracting~~ extract signature codes from the signal components ~~for identifying~~ to identify the at least one tag.

65. (Withdrawn - currently amended) The device ~~according to~~ of claim 64, ~~including means for frequency sweeping further comprising circuitry configured to frequency sweep the~~ excitation component in frequency for at least one of:

operating the at least one tag at resonance of at least one transformer[[,]]; and
resolving contention between ~~simultaneously responding~~ simultaneously-responding tags.

66. (Withdrawn - currently amended) The device ~~according to~~ of claim 64, ~~including further comprising tag transporting means for transporting circuitry configured to transport in~~ operation the at least one tag spatially in relation to the interrogation interfacing ~~means~~ circuitry, ~~wherein the signal processing means being operable~~ circuitry is further configured to sample the response signal repetitively at intervals for resolving ~~multiple tag~~ multiple-tag contention.

67. (Withdrawn - currently amended) The device ~~according to~~ of claim 64, wherein the interrogation interfacing ~~means~~ circuitry comprises a plurality of antennas spatially disposed ~~arranged~~ in relation to the at least one tag ~~for radiating and configured to radiate~~ the interrogating radiation, ~~and wherein the signal processing means being operable~~ circuitry is further configured to:

switch in sequence through the antennas to interrogate the at least one tag from varying distances[[,]]; and

[[to]] process corresponding response signals at the device for resolving multiple tag contention.

68. (Withdrawn - currently amended) A tagging system ~~incorporating~~ comprising at least one variable frequency tag[[;]] ~~according to claim 39~~ and a device ~~for interrogating configured to interrogate and identifying~~ identify the at least one tag.

69. (Withdrawn - currently amended) A method of interrogating a variable frequency tag ~~according to claim 39~~ using an interrogating device, the method comprising ~~the steps of:~~

[[a)]] emitting interrogating radiation from the device ~~towards~~ toward the tag;

[[b)]] receiving the interrogating radiation at the tag and generating a corresponding received signal;

[[c)]] receiving the received signal at processing ~~means~~ circuitry of the tag;

[[d)]] outputting a signature signal from the processing ~~means~~ circuitry in response to receiving the received signal ~~thereat~~, wherein the signature signal ~~including~~ includes a signature code ~~for use in identifying~~ that identifies the tag, and wherein the signature code [[being]] is output at a rate dependent upon a supply potential difference energizing the tag;

[[e)]] radiating the signature signal as response radiation from the tag;

[[f)]] receiving the response radiation from the tag at the device and generating a corresponding interrogation received signal ~~thereat~~; and

[[g)]] filtering the interrogation received signal in the device to isolate at least one spectral component corresponding to the tag, extracting the signature code of the tag from the at least one spectral component, and [[then]] correlating the signature code with at least one signature template to identify the tag.

70. (Withdrawn - currently amended) The method ~~according to~~ of claim 69, [[and]] further comprising deriving the supply potential difference from the received signal.

71. (Withdrawn - currently amended) The method ~~according to~~ of claim 70, [[and]] further comprising enhancing the supply potential difference by using a piezo-electric step-up transformer.

72. (Withdrawn - currently amended) The method ~~according to~~ of claim 71, wherein the interrogating radiation ~~includes~~ comprises a component for exciting the transformer into vibration, the method ~~involving~~ further comprising sweeping the component in frequency for determining when the tag is operating at resonance of its transformer.

73. (Withdrawn - currently amended) A method of resolving contention between a plurality of variable frequency tags according to claim 39, wherein the tags are interrogated from an interrogating device, the method comprising ~~the steps of~~:

[[a]] emitting interrogating radiation from the device ~~towards~~ toward the tags;

[[b]] receiving the interrogating radiation at each tag and generating a corresponding received signal ~~thereat~~;

[[c]] receiving, at each tag, the received signal at processing ~~means~~ circuitry of the respective tag;

[[d]] outputting a signature signal from the processing ~~means~~ circuitry of each tag in response to receiving the received signal ~~thereat~~, wherein the signature signal including includes an associated signature code ~~for use in identifying that identifies~~ the respective tag, wherein the signature code ~~[[being]]~~ is output at a rate dependent upon a supply potential difference energizing the respective tag, and wherein the potential difference ~~[[being]]~~ is derived from the received signal of the respective tag;

[[e]] radiating the signature signal of each tag as response radiation from the respective tag;

[[f]] receiving the response radiation from the tags at the device and generating a corresponding interrogation received signal ~~thereat~~;

[[g]] filtering the interrogation received signal at the device to isolate at least one spectral component corresponding to the tags, extracting the signature codes of the tags from the at least one spectral component, and ~~[[then]]~~ correlating the signature codes with at least one signature template for identifying the tags; and

[[h]] if contention exists with respect to at least one of the spectral components, repetitively modifying a spatial relationship between the device and the tags and repeating the previous steps a) to g) until the contention is resolved.

74. (Withdrawn - currently amended) A method of resolving contention between a plurality of variable frequency tags according to claim 39, wherein the tags are interrogated from an interrogating device, the method comprising ~~the steps of~~:

[[a))] emitting interrogating radiation from the device ~~towards~~ toward the tags;

[[b))] receiving, at each tag, the interrogating radiation and generating a corresponding received signal thereat;

[[c))] receiving, at each tag, the received signal at processing ~~means~~ circuitry of the respective tag;

[[d))] outputting a signature signal from the processing ~~means~~ circuitry of each tag in response to receiving the received signals thereat, wherein the signature signal ~~including~~ includes an associated signature code ~~for use in identifying~~ that identifies the respective tag, wherein the signature code ~~[[being]]~~ is output at a rate dependent upon a supply potential difference energizing the respective tag, wherein the potential difference ~~[[being]]~~ is derived from the received signal of the respective tag, and wherein the signature code ~~[[being]]~~ is output repetitively with pauses therebetween during which the code is not output;

[[e))] radiating the signature signal of each tag as response radiation from the respective tag;

[[f))] receiving the response radiation from the tags at the device and generating a corresponding interrogation received signal ~~thereat~~;

[[g))] filtering the interrogation received signal at the device to isolate at least one spectral component corresponding to the tags, extracting the signature codes of the tags from the at least one spectral component, and ~~[[then]]~~ correlating the signature codes with at least one signature template for identifying the tags; and

[[h))] if contention exists with respect to at least one of the spectral components, repeating the previous steps ~~a) to g)~~ until the contention is resolved.

75. (Withdrawn - currently amended) A method of resolving contention between a plurality of variable frequency tags according to claim 39, wherein the tags are interrogated from an interrogating device, the method comprising ~~the steps of~~:

[[a))] emitting interrogating radiation from the device ~~towards~~ toward the tags;

[[b))] receiving the interrogating radiation at each tag and generating a corresponding received signal ~~thereat~~;

[[c))] receiving at each tag the received signal at processing ~~means~~ circuitry of the respective tag;

[[d))] identifying at least one pulse present in the received signal at each tag, and outputting an associated signature signal from the processing ~~means~~ circuitry of the respective tag in response to receiving the received signal ~~thereat~~ depending on whether or not the at least one pulse is coincident with a time window associated with the respective tag, wherein the signature signal ~~including~~ includes an associated signature code for use in identifying the respective tag, wherein each signature code ~~[[being]]~~ is output at a rate dependent upon a supply potential difference energizing the respective tag, and wherein the potential difference ~~[[being]]~~ is derived from the received signal of the respective tag;

[[e))] radiating the signature signals as response radiation from at least one of the tags;

[[f))] receiving the response radiation from the at least one tag at the device and generating a corresponding interrogation received signal ~~thereat~~;

[[g))] filtering the interrogation received signal at the device to isolate at least one spectral component corresponding to the at least one tag, extracting the signature codes of the at least one tag from the at least one spectral component, and ~~[[then]]~~ correlating the signature codes with at least one signature template for identifying the at least one tag; and

[[h))] if contention exists with respect to at least one of the spectral components, outputting the at least one pulse in the interrogating radiation to temporarily disable at least one

of the tags from responding and repeating the previous steps a) to g) until the contention is resolved.

76. (Withdrawn - currently amended) The method ~~according to~~ of claim 75, wherein a time window of each tag is temporally dependent upon a clocking rate at which the processing means circuitry of the at least one tag is clocked, and wherein the clocking rate in turn ~~[[being]]~~ is dependent ~~[[upon]]~~ on the supply potential difference of the respective tag.